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PRELIMINARY INVESTIGATION OF ALDRIN, DIELDRIN, ENDRIN, AND MERCURY RESIDUES IN EGGS AND YOUNG WATERFOWL NESTING AT ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO

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16 EGGS AND 12 YOUNG WATERFOWL WERE TAKEN FROM NESTS IN THE LAKES AREA AND ANALYZED FOR ALDRN, ENDRN, DLDRN, AND HG. THE CONTAMINANTS FOUND IN HIGHEST CONCENTRATIONS, DLDRN AND HG, WERE AT DANGEROUS LEVELS IN THE EGGS. ALL THE EGGS ALSO HAD DETECTABLE ALDRN AND ENDRN. IT IS EVIDENT THAT WATERFOWL ATTEMPTING TO NEST IN THE LAKES AREA ARE EXPOSED TO A TOXIC ENVIRONMENT.

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Preliminary Investigation of Aldrin, Dieldrin, Endrin, and Mercury Residues in Eggs and Young of Waterfowl Nesting at the Rocky Mountain Arsenal, Denver, Colorado

Waterfowl nest and brood searches were made in the vicinity of 4 lakes at the Rocky Mountain Arsenal (RMA) in May-July, 1984. Fewer nests and broods were found than would be expected in the available habitat. A total of 36 eggs of 3 species (mallard, Canada goose, and American coot) were collected from 30 nests. Twenty-one young waterfowl were collected from 18 broods of 4 species (mallard, redhead, Canada goose, and American coot). Because of funding limitations, only 16 of the eggs and 12 breast samples of the young birds were analyzed for organochlorine residues. The 16 eggs and only two breast muscle samples were analyzed for mercury content. Most of the young waterfowl collected were too small to provide sufficient breast tissue for both organochlorine and mercury analysis.

The numbers of samples were too small to allow statistical testing for differences in residue concentrations between species or collection sites. The mean concentrations in eggs and young of the different species are summarized in Table 1. Mallard eggs were the highest and Canada goose eggs the lowest in dieldrin content. This apparent species difference may not be real because most of the mallard eggs were collected near Lower Derby and most of the goose eggs near Lake Mary; thus some of the difference may be related to the collection site. The dieldrin levels in the mallard and American coot eggs were within the range known to adversely affect reproduction in certain other wild avian species. Domestic chickens can tolerate relatively high concentrations of dieldrin in their eggs (up to 17 ppm) without evident reproductive harm but golden eagles had severe nesting failure when mean dieldrin levels in eggs were 0.9 ppm (Lockie et al. 1969). Brown pelicans failed to produce young when dieldrin concentrations in the eggs exceeded 0.94 ppm (Harris and Eschmeyer 1982). All of the eggs in this study also contained detectable aldrin and endrin residues. Concentrations of aldrin and endrin were lower than dieldrin in each egg, but these chemicals, particularly endrin, are highly embryotoxic and also are a poisoning hazard to newly hatched young when present in the yolk sac.

Mercury residues in the eggs were quite variable. American coot eggs had the highest mean concentration (0.33 ppm). The 3 coot eggs analyzed were collected from 3 different lakes; the egg from Lower Derby had the most mercury (0.46 ppm). The Canada goose eggs all were low in mercury content (<0.01 to 0.02 ppm) with the exception of one egg from Lower Derby that had 0.40 ppm. Thus, the most contaminated eggs of each of the 3 species sampled had mercury concentrations near the level (0.5 ppm) known to cause reproductive failure in other avian species (Scott and Eschmeyer 1976). Only 2 breast samples were analyzed for mercury. One of these, a mallard duckling from Gun Club Pond, had the highest mercury level detected (0.48 ppm).

Although this was a small series of samples, it is ev ident that waterfowl attempting to nest in the lower lakes area of the RMA are exposed to a toxic environment. The contaminants found in highest concentrations, dieldrin and mercury, were both at dangerous levels in eggs of the 3 species studied. All the eggs also had detectable aldrin and endrin, extremely toxic chemicals. The effects of these combined toxicants are not known but are probably additive. More field observations and more chemical analyses are needed to fully assess the contaminant hazards to waterfowl using RMA wetlands.

Rocky Mountain Arsenal
Information Center
Commerce City, Colorado

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Harris, V. T. and P. H. Eschmeyer (eds.). 1976. Shell thickness and residues in brown pelican eggs. pp 30-31 in Sport Fishery and Wildlife Research, 1974-75. U.S. Dept. Interior, Fish and Wildlife Service, Washington, D.C. 137 pp.

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Scott, T. G. and P. H. Eschmeyer (eds.). 1982. Hawaiian seabird eggs contain mercury and organochlorine pollutants. pp. 42-43 in Fisheries and Wildlife Research, 1981. U.S. Dept. Interior, Fish and Wildlife Service, Washington, D.C. 191 pp.

Table 1. Mean dieldrin, endrin, and mercury concentrations and lipid content in eggs and young of waterfowl collected at the RMA.

Species	Tissue	No.	Dieldrin ppm[1/]	Endrin ppm[1/]	Mercury ppm[1/]	Lipid %
Mallard	Eggs	7	2.80 (5.7)[2/]	0.07 (0.19)	0.19 (0.44)	15.2 (16.6)
C. goose	Eggs	6	0.17 (0.29)	0.02 (0.05)	0.07 (0.40)	17.1 (21.6)
Am. coot	Eggs	3	0.76 (1.6)	<0.01 (0.01)	0.33 (0.46)	14.8 (20.7)
Mallard	Breast	5	0.04 (0.11)	<0.01 (<0.01)	0.48[3/]	0.9 (1.3)
C. goose	Breast	1	0.02	<0.01	<0.01[3/]	1.4
Am. coot	Breast	4	0.04 (0.15)	<0.01 (<0.01)	[4/]	1.9 (3.8)
Redhead	Breast	2	0.08 (0.08)	<0.01 (<0.01)	[4/]	2.3 (2.4)

[1/] Parts per million, wet weight basis.

[2/] Maximum values are given in parentheses.

[3/] Only one sample analyzed.

[4/] No samples analyzed.

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Table 2. Mean dieldrin, endrin, and mercury concentrations in waterfowl eggs and breast muscle of young birds collected from four sites on the RMA.

Site	Tissue	No.	Dieldrin ppm[1/]	Endrin ppm[1/]	Mercury ppm[1/]
Lower Derby	Eggs	8	2.7	0.06	0.27
	Breast	4	0.08	<0.01	[2/]
L. Ladora	Eggs	2	0.12	<0.01	0.04
	Breast	2	0.01	<0.01	[2/]
L. Mary	Eggs	5	0.24	0.02	0.07
	Breast	2	0.08	<0.01	<0.01[3/]
G. C. Pond	Eggs	1	0.04	<0.01	0.21
	Breast	4	0.01	<0.01	0.48[3/]

1/ Parts per million whole egg wet weight basis.

2/ Quantity of breast muscle from young birds was insufficient for mercury analysis.

3/ Only one sample analyzed for mercury.

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